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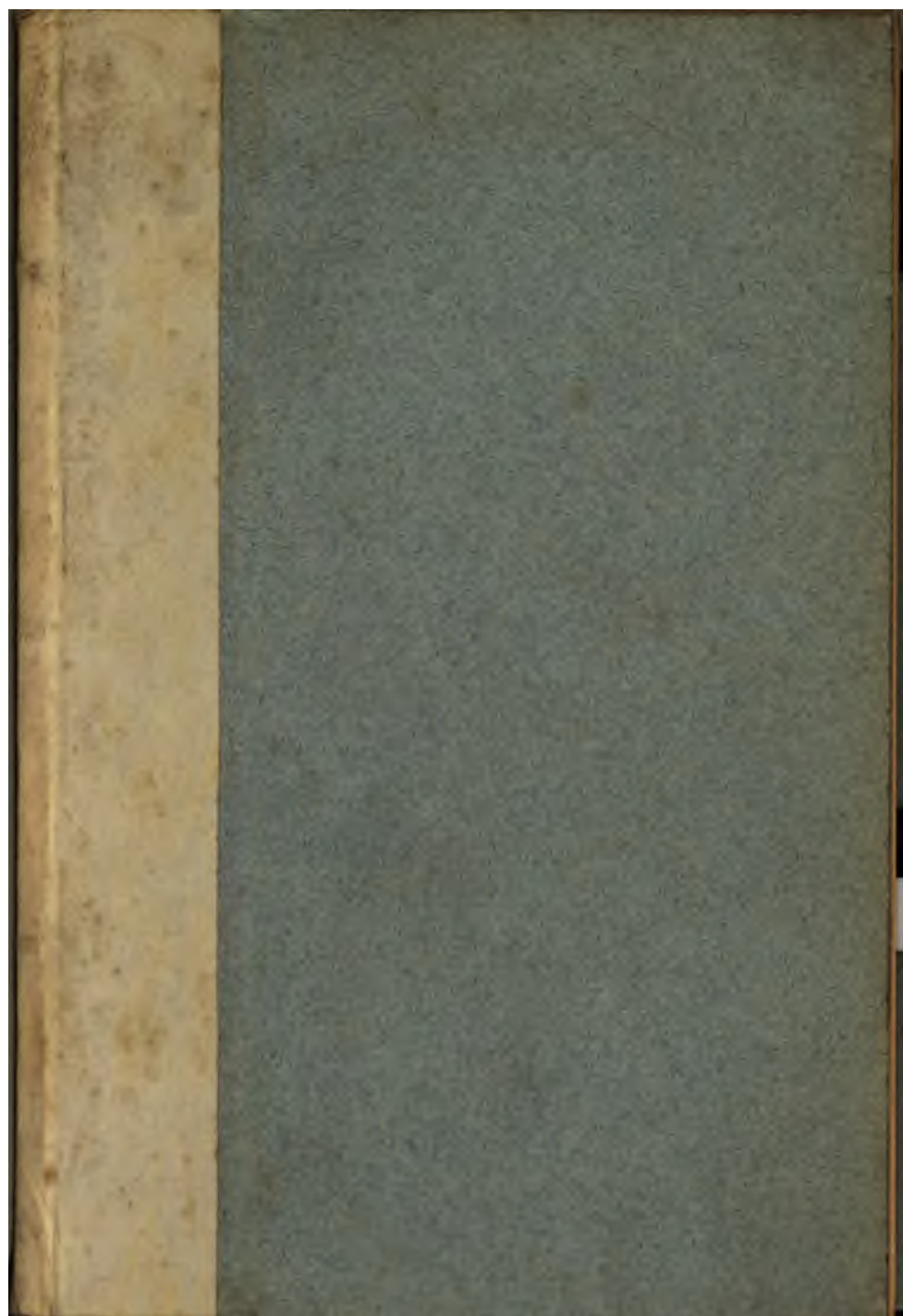
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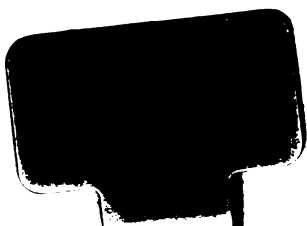
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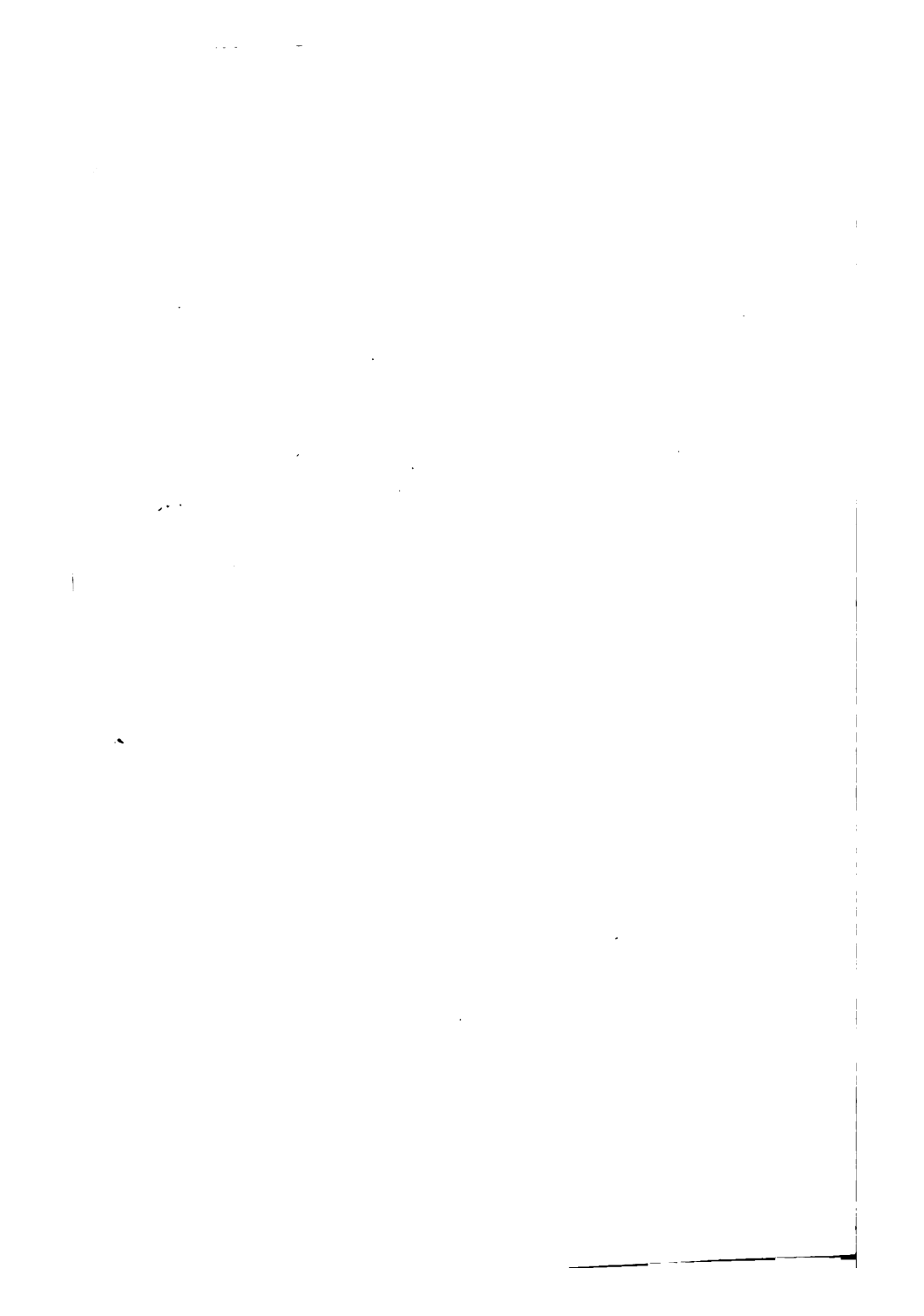




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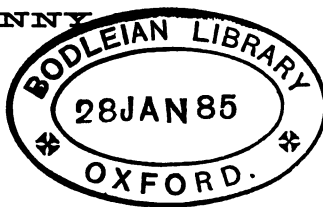
CASUALTIES AND DISEASES OF VEGETABLE LIFE.

BY
BRUCE FINDLAY,

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SOCIETY OF MANCHESTER.

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ALSO,

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CASUALTIES AND DISEASES

OF

VEGETABLE LIFE.

BEFORE examining the casualties of vegetable life it is important that we should know what a vegetable or plant really is, for it is a term the most ignorant presume they understand, although the most learned are unable exactly to define ; for a plant is, as Theophrastus long ago observed, "A various thing, of which it is difficult to give a definition." Physiologists the most astute have laboured, and do labour still, comprehensively to define a plant. The dilemma somewhat resembles that in which an ancient philosopher is said to have been involved, who, when desiring to state what motion was, after much consideration, rose from his seat, walked towards the inquirer, and replied, "You see it. I can show it to you, but I cannot tell you what motion is." Thus, also, a botanist might answer, "Here are plants ; you see them, even if I cannot tell you precisely what a vegetable is." Let not the bearing of this statement, however, be misunderstood. It is not Science who makes the difficulty she here points out. She only shows what already is, just as a microscope does not make the hairs on a mite's back, but only brings them within our sphere of vision. If vegetables are living beings, endowed with sensation and instinct, or anything approaching to it, so as to give them a resemblance to animals, how are we certainly to distinguish

the plant from the animal? At the extreme of the two kingdoms the distinction is easy. The more perfect animals can never be mistaken for plants, nor the more perfect plants for animals; but at the mean the shades of discrimination are so very faint that of some individual productions it is almost impossible to say to which of the kingdoms they belong. Hence it is that substances which have at one time been classed among plants have at another time been classed among animals, and there are substances to be met with whose place has not yet been satisfactorily determined. Of these I may exemplify the genus *Corallina*, which Linnæus placed among animals, but which Gærtner places among plants; and between authorities so great, who shall attempt to decide? To the inexperienced naturalist, perhaps, the undertaking may appear easy, but the great diversity of rules which have been devised for the purpose of fixing the limits of the two kingdoms, shows but too plainly the difficulty of the task. Linnæus, the great reformer of natural history, and chief of all bôtanists, as well became him, attempted to "fix and define" the boundaries of the mineral, vegetable, and animal kingdoms. His definition is as follows:—

"Stones grow; plants grow and live; animals grow, live, and feel."

This definition is extremely plausible, and bears upon the face of it the genuine stamp of the bold and masterly manner of Linnæus. But with all due deference to that great and illustrious naturalist, still his definition must be regarded as defective, at least as relative to the distinction between the animal and the plant; for, in the first place, as it is not quite certain that some plants do not also feel as well as live, and in the next place, as we are possessed of no criterion by which we may infallibly judge of the existence of the faculty of sensation, the difficulty of decision remains the

same as before. M. Bonnet, of Geneva, defined the plant to be an organised body, nourished by means of roots placed externally, the animal being just the converse ; that is, an organised body nourished by means of roots placed internally: this solution is sufficiently applicable to the generality of cases, but it fails just where the others have been found to fail—that is, in cases which are really doubtful. M. Mirbel, a botanist of some considerable celebrity on the Continent, has introduced a criterion founded on the character of the substances on which plants and animals respectively feed. Plants feed upon unorganised substances ; that is, upon earths, salts, water, or gases. Animals feed upon substances already organised ; that is, either upon vegetables or animals, or their products, but never wholly upon substances in an unorganised state. Such is obviously the fact, at least, in the case of the more perfect animals and vegetables. Finally, Keith gives the following definition of the vegetable and animal : “ A vegetable is an organised and living substance springing from a seed, which it again produces, and effecting the development of its parts by means of the introsusception or nutrition and assimilation of unorganised substances which it derives from the atmosphere or the soil in which it grows. The definition of the animal is the counterpart. An animal is an organised and living being proceeding from an egg or embryo, which it again produces, and effecting the development of its parts by means of the introsusception of organised substances or their products.” No doubt, however, difficulties will always remain, for if Nature has not assigned to the animal and vegetable kingdoms any definite and specific limits, but has blended them as it were both together, it is in vain for man to institute his distinctions. There can be no doubt, I think, upon one point, viz., that plants are nourished in a manner in some degree analogous

to the animal economy. The food of plants, whether lodged in the soil or wafted through the atmosphere, is taken up in the form of gases ; it is then known as their sap ; this sap ascends to the leaves, where it is elaborated as the blood of animals is in the lungs ; it then enters into the general circulation of the plant and promotes its growth. Now inasmuch as plants are, like animals, organised and living beings, they are, like animals also, liable to such accidental injuries and disorders as may affect the health and vigour, or occasion the death of the individual, which is at any rate eventually effected by means of natural decay and the final extinction of the vital principle. Hence the subject of vegetable casualties divides itself into the three following heads : wounds, diseases, natural decay. A wound is a forcible separation of the solid parts of the plant, effected by means of some external cause. It may be intentional, as in the case of incision, boring, grafting, pruning, felling, and such like operations ; or, it may be accidental, as in the case of injuries sustained by the rubbing of cattle, by the bite and depredation of insects, by lightning, by weight of fruit, or by violent storms. Incisions are sometimes necessary to the health of the tree in the same manner, perhaps, as bleeding is necessary to the health of the animal. The trunk of the plum and cherry tree seldom expand freely till a longitudinal incision has been made in the bark, and hence this operation is often practised by gardeners. If the incision affects the epidermis only, the epidermis being a thin membrane covering the bark of plants, it heals up without leaving any scar ; if it penetrates into the interior of the bark, it heals up only by means of leaving a scar ; but if it penetrates into the wood, the wound in the wood itself never heals up completely, but new wood and bark are formed about it as before.

Boring is an operation by which trees are often wounded for the purpose of making them part with their sap in the season of their bleeding, particularly the birch tree and American maple; a slanting hole is bored in them with a wimble, so as to penetrate an inch or two into the wood, from this the sap flows copiously, and though a number of holes are often bored in the same trunk the health of the tree is not materially, if at all, affected.

Fractures.—If a tree is bent so as to break part only of the cortical and woody fibres, and the stem or branch but small, the parts will again unite by being put back into their natural position and well propped up. Especially, the cure may be expected to succeed if the fracture happens in the spring, but it will not do so if the fracture is accompanied with contusion, or if the stem or branch is large, and even where it succeeds, the woody fibres do not contribute to the union, but the granular substance only, which exudes from between the wood and liber (the liber being the newly formed bark), insinuating itself into all interstices and finally becoming indurated into wood.

Pruning.—Wounds are inflicted in the pruning or lopping off of superfluous branches, but this is seldom attended with any bad effects to the health of the tree if done by a skilful practitioner; indeed no further art is required, merely for the protection of the tree, beyond that of cutting the branch through in a sloping direction so as to prevent the rain from lodging. In this case the wound soon closes up by the induration of the exposed surface of the section, and by the protrusion of a granular substance, forming a sort of circular lip between the wood and bark, and hence the branch is never elongated by the growth of the same vessels that have been cut, but by the protrusion of new buds near the point of section. In the operation of grafting, there is

a wound both of the stock and graft which are united, not by the immediate adhesion of the surfaces of the two sections, but by means of a granular and herbaceous substance exuding from between the wood and bark and insinuating itself as a sort of cement into all open spaces ; new wood is finally formed within it, and the union is complete.

Felling is the operation of cutting down trees close to the ground, which many of them will yet survive if the stump is protected from the injuries of animals, and the root fresh and vigorous. In this case the fibres of the wood are never again regenerated, but a lip is formed as in the case of pruning, and buds that spring up into new shoots are protruded near the section, so that from the old shoot ten, twelve, or even twenty new stems may issue, according to its size and vigour. The stools of the oak and ash tree will furnish good examples ; but there are some trees, such as the fir, that never send out any shoots after the operation of felling.

Destruction of Buds.—Buds, which expand in the spring, are generated in the preceding summer, and augmented and prepared for development in the intervening winter. But if the buds are destroyed in the course of the winter, or in the early part of the spring, many plants will again generate new buds as the others would have done, except that they never contain blossom or fruit.

By what means are the buds regenerated?—Dr. Hamel thought they sprang from pre-organised germs, which he conceived to be dispersed throughout the whole of the plant. But Knight thinks he has discovered the true source of the regeneration of buds in the proper juice that is lodged in the alburnum of trees. Buds thus regenerated never contain or produce either flower or fruit. Perhaps it is because

the fruit bud requires more time to develop its parts, or a peculiar and higher degree of elaboration, and that this hasty production is only the effect of a great effort of the vital principle for the preservation of the individual, and one of those wonderful resources to which Nature always knows how to resort when the vital principle is in danger.

Destruction of Leaves.—Sometimes the leaves of a tree are destroyed partially or totally as soon as they are protruded from the bud, either by the depredations of insects or by the browsing of cattle. But if the injury is done early in the spring new leaves will be again protruded with subsequent shoots. Some trees will bear to be stripped more than once in a season, as is the case with the mulberry-tree, which is cultivated in the South of France and Italy for the purpose of feeding the silk-worm. Abortion or failure in the produce of flowers, fruit, or perfect seeds, is generally the effect of accidental injuries, either directly to the flower or fruit, by which they are rubbed off or devoured by insects, or to the roots, by exposure to the air, or cutting off so much of them as essentially to lessen their power of drawing up nourishment. Premature inflorescence or fruiting is sometimes brought on by insects, but more generally by checks produced by cold, or injuries from excessive heat, or long-continued drought. Fruit is often ripened prematurely by the direct puncture of insects, and a pine-apple plant of almost any age may be thrown into fruit by an hour or two's exposure to a frosty atmosphere, or by scorching the roots in a hot-bed. The stripping of the bark of a tree may be either intentional or accidental, partial or total; if total the tree dies.

Proceed we next to consider Diseases. They are corrupt affections of the vegetable body, arising from a vitiated state of its juices, and tending to injure the habitual health either

of the whole, or part. The diseases that occur the most frequently among vegetables are the following:—blight, smut, mildew, honeydew, dropsy, flux of juices, gangrene, suffocation, contortion, consumption. *Blights* are of various descriptions, but that which is most fatal is caused by the wind. Drying winds completely deprive, by rapid evaporation, all the tender leaves and flowers of their juices faster than they can be supplied. Much has been written on the nature of blight, and in proportion as words have been multiplied on the subject, the difficulties attending its elucidation have increased. This disease was well known to the ancient Greeks, who were, however, totally ignorant of its cause, regarding it merely as a blast from heaven indicating the wrath of their offended deities, and utterly incapable of prevention or cure. It was known, also, to the Romans, under the denomination of “*rubigo*,” who regarded it in the same light as the Greeks, and even believed it to be under the direction of a particular deity—*Rubigus*—whom they solemnly invoked that blight might be kept from corn and trees. Perhaps there is no one cause that will account for the disease known by the name of blight. If we take the term in its most general acceptance, I think it will include at least three distinct species—blight originating in cold and frosty winds; blight originating in a sort of sultry pestilential vapour, and blight originating in the immoderate propagation of a sort of small fungus. The first species is often occasioned by the cold and easterly winds of spring, which nip and destroy the tender shoots of the plant by stopping the current of the juices. The leaves which are thus deprived of their due nourishment wither and fall, and the juices, that are now stopped in their passage, swell and burst the vessels, and become the food of insects that soon alter their appearance. Hence, they are often mistaken for the

cause of the disease itself. A similar disease is often occasioned by the early frost of spring. If the weather is prematurely mild the blossom is prematurely protruded, which, though it is viewed by the inexperienced with delight, the more judicious regard with fear, for it very often happens that this premature blossom is totally destroyed by subsequent frosts, as well as both the leaves and shoots, which consequently wither and fall, and injure, if they do not actually kill, the plant. This evil is also often augmented by the unskilful gardener—even in attempting to prevent it—that is, by matting up his trees too closely, and thus rendering the shoots so tender that they can scarcely fail to be destroyed by the next frost.

The second species generally happen in the summer, when the grain has attained to its full growth, and when there are no cold winds or frosts to occasion it. Such was the blight that used to damage the vineyards of ancient Italy, and which is yet found to damage our hop plantations and wheat crops. The Romans had observed that it generally happened after short but heavy showers, followed by clear sunshine, about the season of the ripening of the grapes. This corresponds pretty nearly to what is in this country called the fire-blast among hops. Wheat is also affected with a similar sort of blight, and about the same season of the year.

The third species attack the leaves or stem both of herbaceous and woody plants, such as *Euphorbius Berberis* or *Rhamnus*, but more generally grasses. It usually assumes the appearance of a rusty-looking powder that soils the fingers when touched. It is known among farmers by the name of *Red rust*, and, as it affects the stalk and leaves only, it does materially injure the crop. But there is another species of fungus, known to the farmer by the name of *Red gum*, which attacks the ear only, and is extremely prejudicial. In the

aggregate it consists of groups of minute globules, interspersed with transparent fibres. The globules are filled with a fine powder, which explodes when they are put into water.

Smut is a disease incidental to cultivated corn, by which the farina of the grain and part of the husk is converted into a black soot-like powder. If the injured ear is struck with the finger the powder will be dispersed like a cloud of black smoke. Some have attributed it to the soil in which the grain is sown, and others to the seed itself, alleging that smutted seed will produce a smutted crop.

Mildew is a thin and whitish coating with which the leaves of vegetables are sometimes covered, occasioning their decay and death.

Honey-dew is a sweet and clammy substance apparent on the surface of the leaves during hot weather, particularly on the leaves of the oak tree and beech, and is regarded by Mr. Curtis, who wrote a paper on the subject, as being merely the dung of some species of aphides. Dropsy plants are also liable to a disease which affects them in a manner similar to that of the dropsy in animals, arising from long-continued rain or too abundant watering. Willdenow describes it as occasioning a preternatural swelling of particular parts, and inducing putrefaction. It takes place chiefly in bulbous and tuberous roots, which are often found much swelled after rain. It affects fruits also, which it renders watery and insipid. It prevents the ripening of seeds and occasions an immoderate production of roots from the stem. Succulent plants in particular are apt to suffer from too profuse watering, and the disease thus occasioned is generally incurable. The leaves drop, even though plump and green, and the fruit rots before reaching maturity.

Flux of Juices.—Some trees, but particularly the oak and birch, are liable to a great loss of sap, either bursting out spontaneously, owing to a superabundance of sap, or issuing from accidental wounds. Sometimes it is injurious to the health of the plant, and sometimes not.

There is a spontaneous effusion of the sap of the vine known by the name of the "Tears of the Vine" which is not injurious, as it often happens that the root imbibes sap which the leaves are not yet prepared to throw off, because not yet sufficiently expanded, owing to an inclement season ; the sap which is first carried up being propelled by that which follows, ultimately forces its way through all obstructions and exudes from the bud. But this is observed only in cold climates, for in hot climates, where the development of the leaves is not obstructed by cold, they are ready to elaborate the sap as soon as it reaches them ; but when the sap ascends more copiously than it can be carried off, it sometimes occasions a fissure of the solid parts, inducing disease or deformity by encouraging the corruption of the ascending or descending juices. Sometimes the fissure is occasioned by means of frost, forming what is called a double alburnum, that is, first a layer that has been injured by the frost and then a layer that passes into wood ; sometimes a layer is partially affected, and that is generally owing to a sudden and partial thaw on the south side of the trunk, which may be followed again by a sudden frost. In this case. the alburnum is split into clefts or chinks by means of the expansion of the frozen sap. But a cleft thus occasioned often degenerates into a chilblain that discharges a blackish fluid, to the great detriment of the plant, particularly if the sore is so situated that rain or snow will readily lodge in it and become putrid ; and as no vegetable ulcer heals up of its own accord, the sooner a remedy is applied to it the

better, as it will, if left to itself, ultimately corrode and destroy the whole plant. The only remedy is the excision of the part affected and the application of a coat of grafting wax.

Gangrene.—Of this disorder there are two varieties, the dry and the wet. The former is occasioned by means of excessive heat or excessive cold. If by means of cold, it attacks the leaves or young shoots and causes them to shrink up, converting them from green to black. It also attacks inner bark, which it blackens in the same manner, so that it is impossible to save the plant except by cutting it to the ground. Sometimes the disease is occasioned by the too rapid growth of a particular branch depriving the one that is next to it of its due nourishment, and hence inducing its decay; but plants are sometimes affected with a gangrene by which a part becomes first soft and moist, and then dissolves into foul matter. This is confined chiefly to the leaves, flowers, and fruit. It seems to be owing in many cases to too wet or too rich a soil, but it may originate in contusion and may be caught by infection.

Suffocation.—Sometimes it happens that the pores of the epidermis are closed up, and transpiration is consequently obstructed by means of some extraneous substance that attaches itself to and covers the bark. This obstruction induces disease, and the disease is called suffocation. It is often caused by the immoderate growth of lichens upon the bark, covering the whole of the plant, as may be often seen in fruit trees, which it is necessary to keep clean by means of scraping off the lichens, at least from the smaller branches; for if the young branches are thus coated, so as that the bark cannot perform its proper functions, the tree will soon begin to languish, and will finally become covered with fungi, inducing or resulting from decay. Sometimes the

disease is occasioned from want of an adequate supply of nourishment as derived from the soil, in which the lower part of the plant is the best supplied, while the upper part of it is starved. Hence, the top shoots decrease in size every succeeding year, because a sufficient supply of sap cannot be obtained to give them their proper development. This is analogous to the phenomena of animal life when the action of the heart is too feeble to propel the blood through the whole of the system ; for then the extremities are always the first to suffer.

Consumption is caused from barren or improper soil ; unfavourable climate ; careless planting, or too frequent flowering exhausting the strength of the plant. It often happens that disease is induced which terminates in a gradual decay and wasting away of the plant, till at length it is wholly dried up. It is also occasioned by excessive drought, or by dust lodging on the leaves, or by fumes issuing from manufactories, or by the attacks of insects.

We come now to the last section—*Natural Decay*. In the preceding sections we have noticed the chief diseases to which plants are liable, whether from external injuries or from internal derangement. But although a plant should not suffer from the influence of accidental injury, or from disease, still there will come a time when its several organs will begin to experience the approaches of a natural decline insensibly stealing upon it, and at last inducing death. For in the vegetable, as well as in the animal kingdom, there is a limit set beyond which the individual cannot pass, though the duration of vegetable existence is very different in different species. Some plants are annuals, and last for one season only. Springing up suddenly from seed—attaining rapidly to maturity—producing and again sowing their seeds, and afterwards immediately perishing—such is the character of

the various kinds of corn. Others continue to live for a period of two years, and are therefore called biennials, springing up the first year from seed and producing root and leaves, but no fruit. Other plants are perennials—that is, lasting for many years, of which some are called under shrubs, and die down to the root every year. Others are called shrubs, and are permanent, both by the root and stem, but do not attain to a great height or great age. Others are called trees, and are not only permanent by both root and stem, but attain to a great size, and live to a great age. But even of plants that are woody and perennial there are parts which perish annually, or which are at least annually separated from the individual, namely, the leaves, flowers, and fruit, leaving nothing behind but the bare caudex, which submits in its turn to the ravages of time, and ultimately to death.

The decay of the temporary organs, which takes place annually, is a phenomenon familiar to everybody, and comprehends the fall of the leaf, the fall of the flower, and the fall of the fruit. The fall of the leaf commences, for the most part, with the colds of autumn, and is accelerated by the frosts of winter, that strip the forest of its foliage, and the landscape of its verdure. But there are some trees that retain their leaves throughout the whole of the winter, though changed to a dull and dusky brown, as those of the beech tree ; and there are others that retain them, even in verdure, till the succeeding spring, when they ultimately fall. Such plants are denominated evergreens. It was, at one time, a vulgar error, and, perhaps, it continues to be so still, that evergreens never shed their leaves at all. This error may be traced back even to the period of the fabulous history of the Greeks, with whose mythology it was closely interwoven. Theophrastus says that “In Crete it was

reported there was a plane-tree, growing by a fountain, which never shed its leaves, being the tree under the shade of which Jupiter was said to have had his interview with Europa." Every accurate observer of Nature is acquainted with the fact of the fall of the leaves of evergreens, though they do not actually fall till the young leaves have begun to appear, so that trees of this sort are never left wholly without leaves, which it was hence supposed they never shed. Many opinions have been advanced as to the cause of their fall; but time will not permit us to examine this part of the subject.

In the natural progress of vegetation the change is effected by the leaf, on the one hand, in its yielding to the influence of physical or chemical agencies and withering and shrinking into narrow compass when the usual supply of sap is no longer transmitted to it, and by the vital principle on the other, in its controlling and directing chemical agencies so as to facilitate the final detachment of the footstalk and form the scar necessary to its own protection, and this effect is operated by the converting of the substance that cements the respective fibres of the leaf, stalk, and branch together, from a soft and glutinous to a dry and brittle consistence, so that the leaf falls at last merely by force of its own weight or of the slightest breath of wind, but without the intervention of any previous chink or crack.

It may be compared to that of the shedding of the antlers of the stag or of the hair or feathers of other beasts or birds, which being like the leaves of plants, distinct organs, fall off and are regenerated annually. The flowers, which like the leaves are only temporary organs, are for the most part very short lived, for as the object of their production is merely that of effecting the impregnation of the germs, that object is no sooner attained than they begin to give indications

of decay and speedily fall from the plant, so that the most beautiful part of the vegetable is also the most transient. The flower of the night-blowing cactus, the most magnificent of all flowers, no sooner expands than it begins to decay, and before the sun has risen upon it its beauty is gone! The flowers of the poppy and tulip, though very gaudy, are very short-lived, and the beautiful blossom of our fruit trees soon begins to fade. The scene often continues blooming indeed, both in the landscape of Nature and of Art, but that is more owing to the succession of blossoms on the same or on different plants than to the permanency of individual blossoms.

The fruit, which begins to appear conspicuous when the flower falls, expands and increases in volume, and assuming a peculiar hue as it ripens, ultimately detaches itself from the parent plant and drops into the soil. But it does not in all cases detach itself in the same manner. Thus in the bean and pea the seed vessel opens and lets the seed fall out, while in the apple, pear, and cherry, the fruit falls entire, enclosing the seed which escapes when the pericarp decays. Most fruits fall soon after ripening, as the cherry and apricot if not gathered, but some remain long attached to the parent plant after being fully ripe, as in the case of the fruit of the thorns and enonymus which may be seen in the hedges in the midst of winter. But these, though tenacious of their hold, detach themselves at last as well as all others, and bury themselves in the soil about to give birth to a new individual in the germination of the seed.

Such, then, is the process of the decay of the temporary organs of the plant. But there is, also, a period beyond which even the permanent organs themselves can no longer carry on the process of vegetation. Plants are affected by the infirmities of old age as well as animals, and are found

to exhibit, also, similar symptoms of approaching dissolution. The root refuses to imbibe the nourishment afforded by the soil ; or, if it does imbibe a portion, it is but feebly propelled and partially distributed through the tubes of the alburnum. The elaboration of the sap is now effected with difficulty, as well as the assimilation of the proper juices, the descent of which is almost totally obstructed ; the bark becomes thick and covered with moss ; the shoot becomes stunted ; and the fruits degenerate both in quantity and quality ; the smaller branches fade and decay first, and then the larger branches also, together with the trunk and root—the vital principle gradually declines, without any chance of recovery, and is, at last, totally extinguished ; while the solid mass of the plant, exposed to the chemical action of surrounding substances to which it now yields, withers and dies away, presenting to the eye a decayed and rotten appearance, and crumbling into the dust from which it originally sprang. Such is the transient duration of the Vegetable and counterpart of Animal Life.



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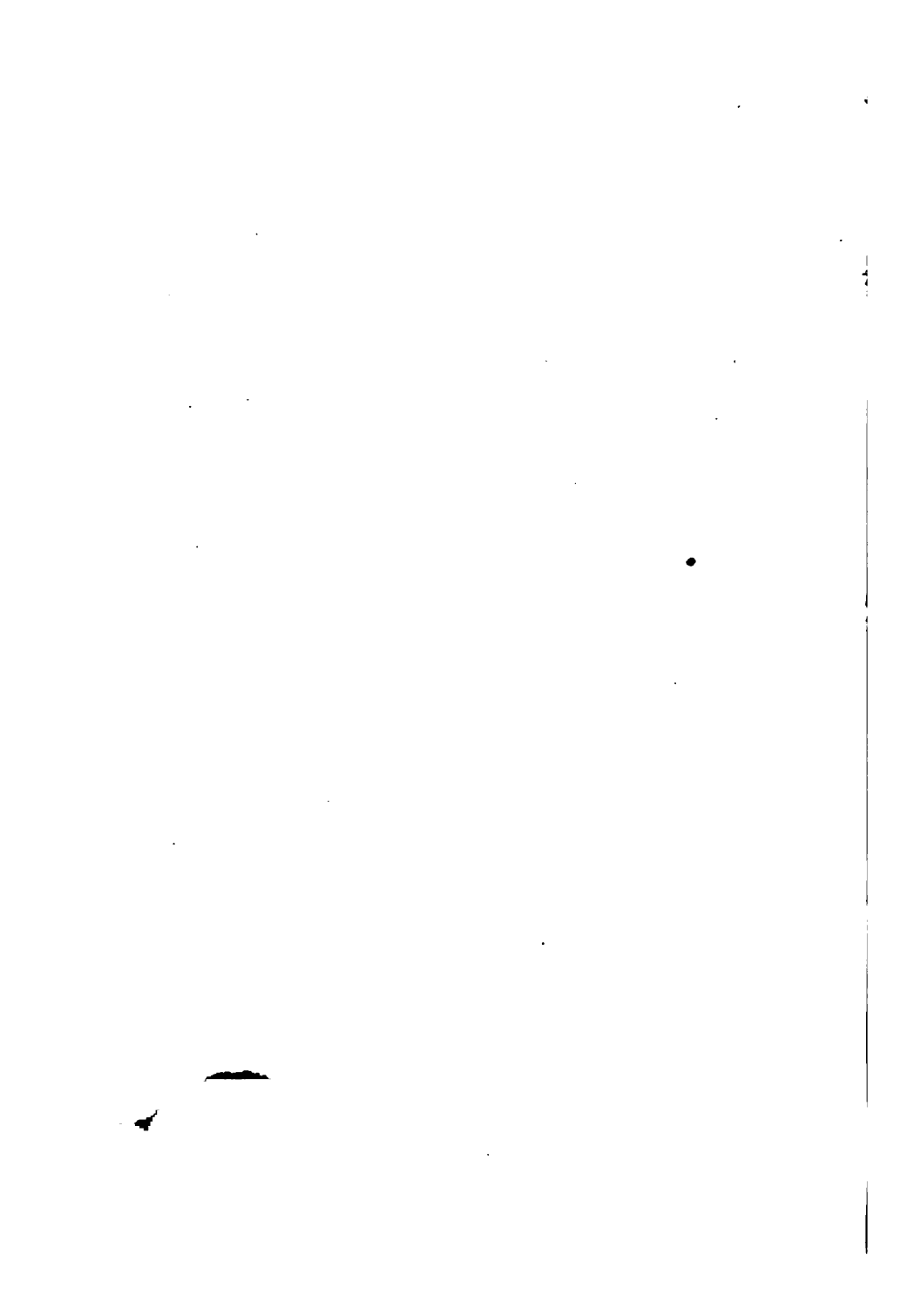
CATALOGUE POST FREE.

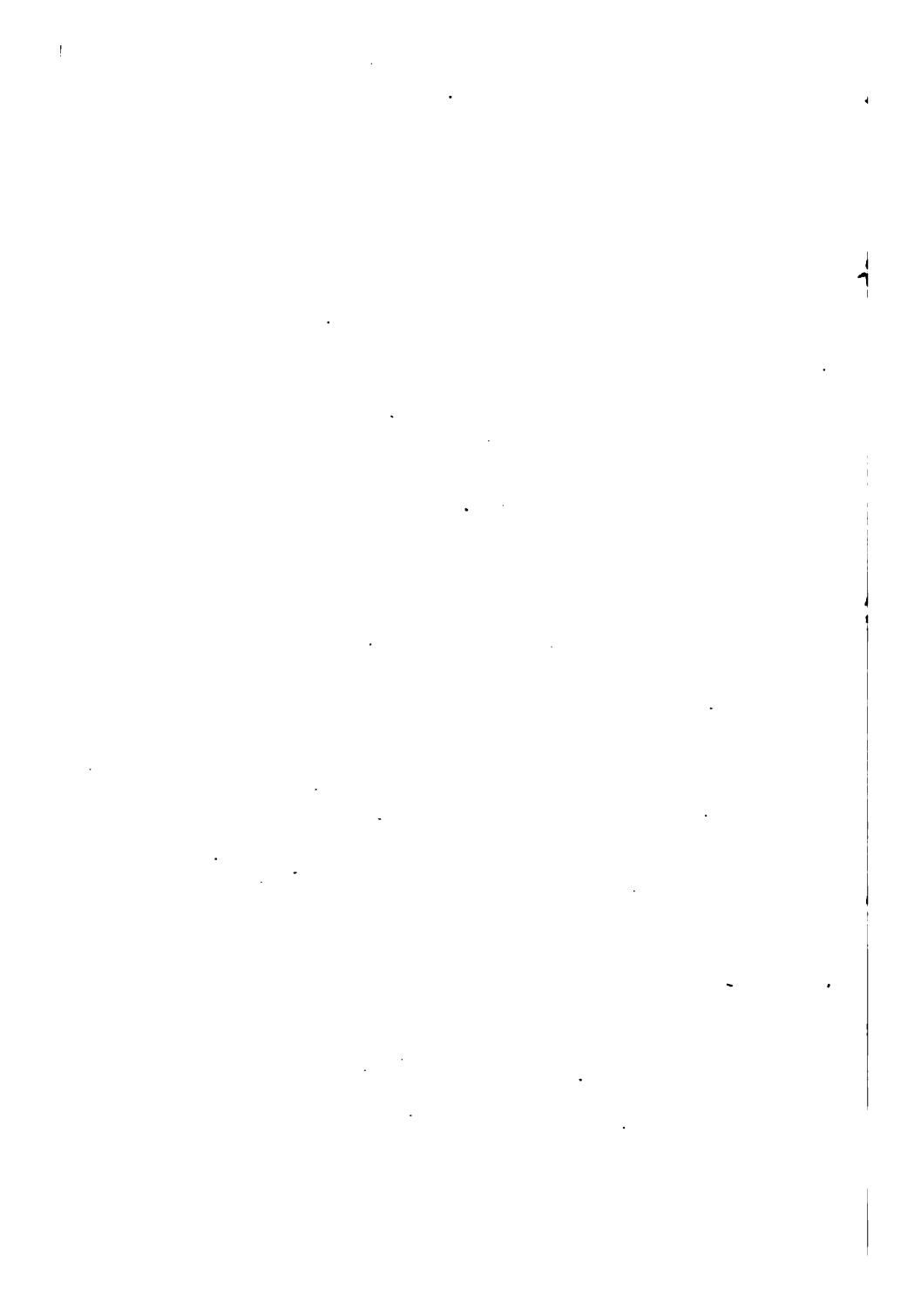
 *All Seeds and Bulbs carriage free.*

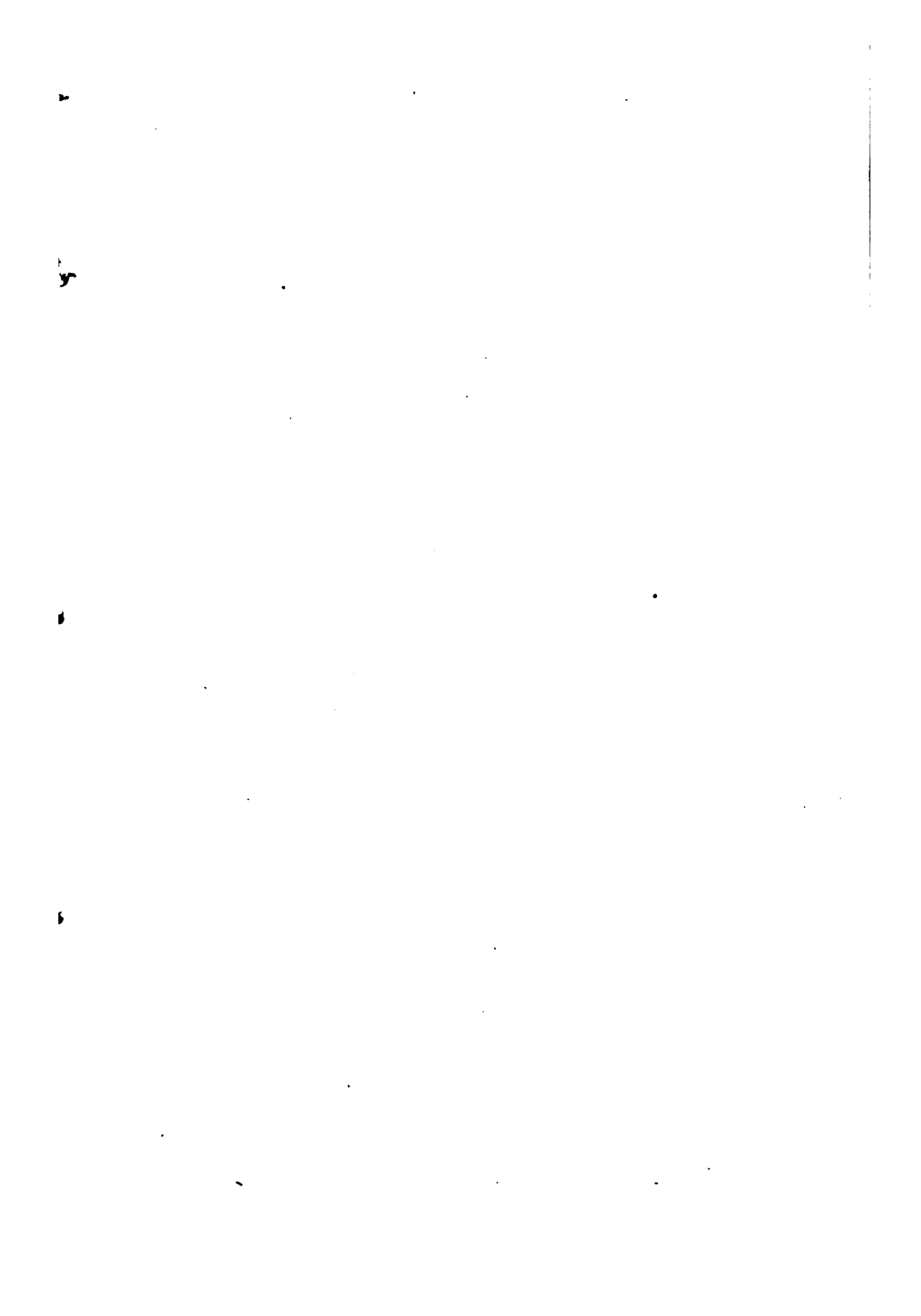










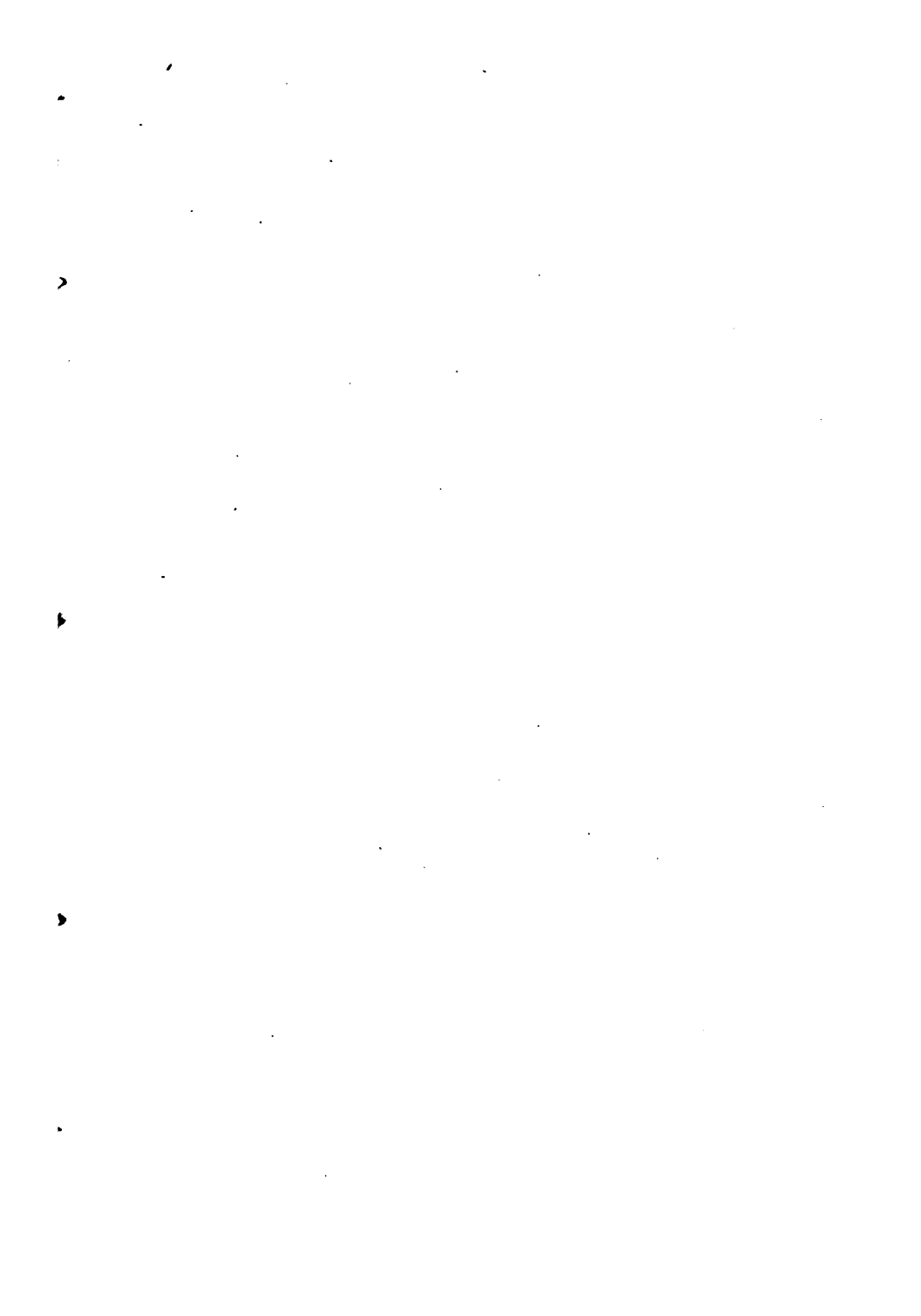


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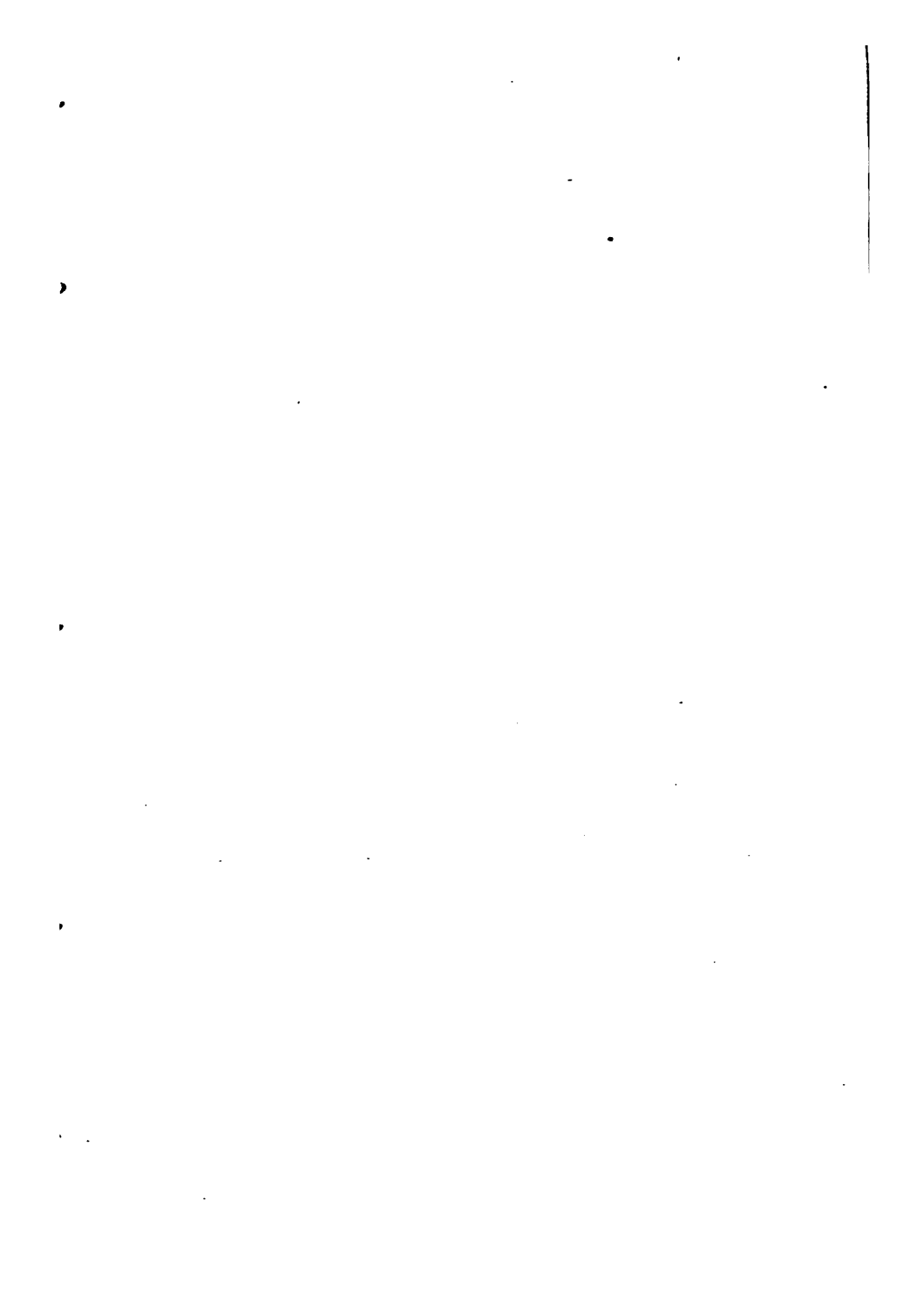
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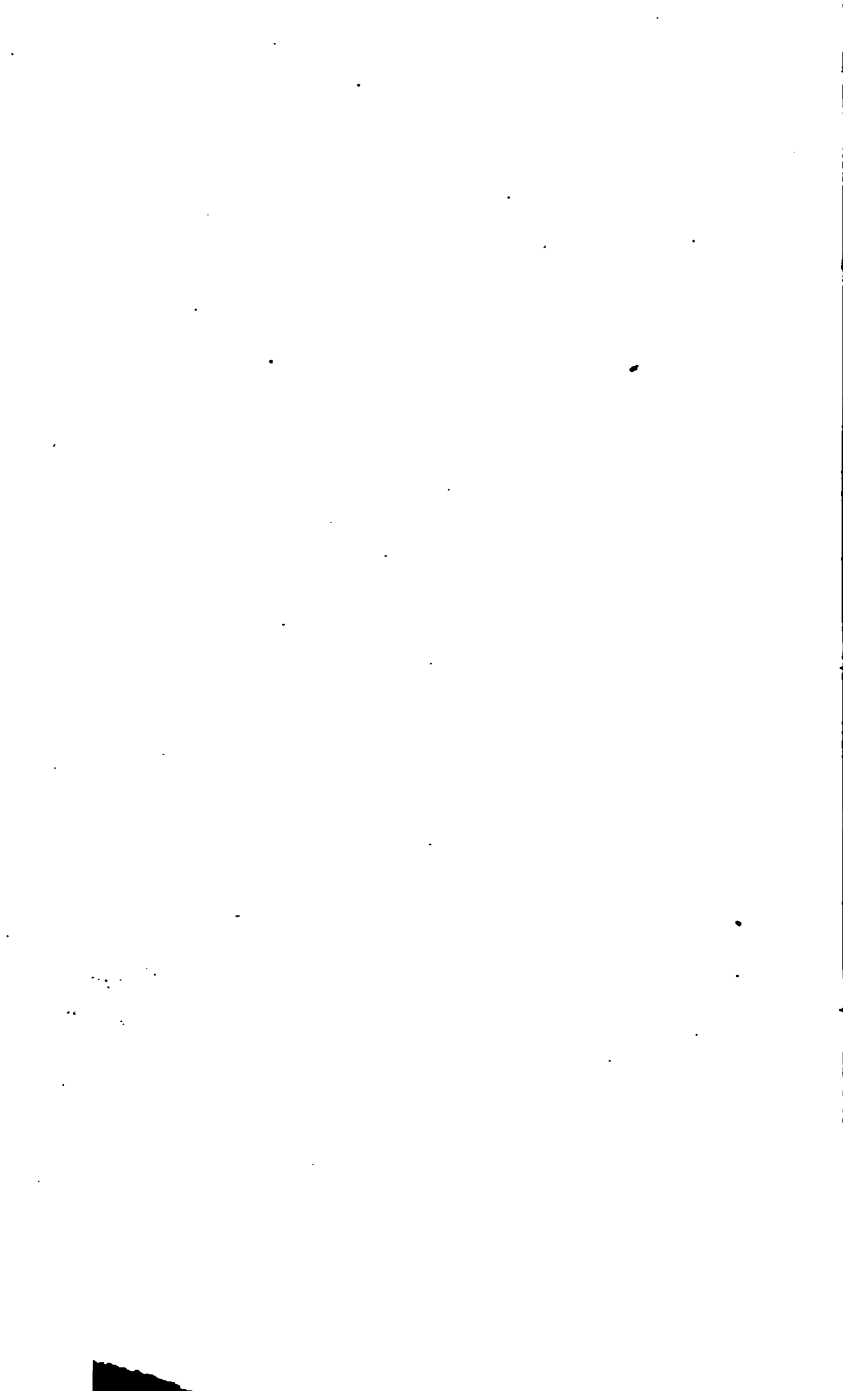
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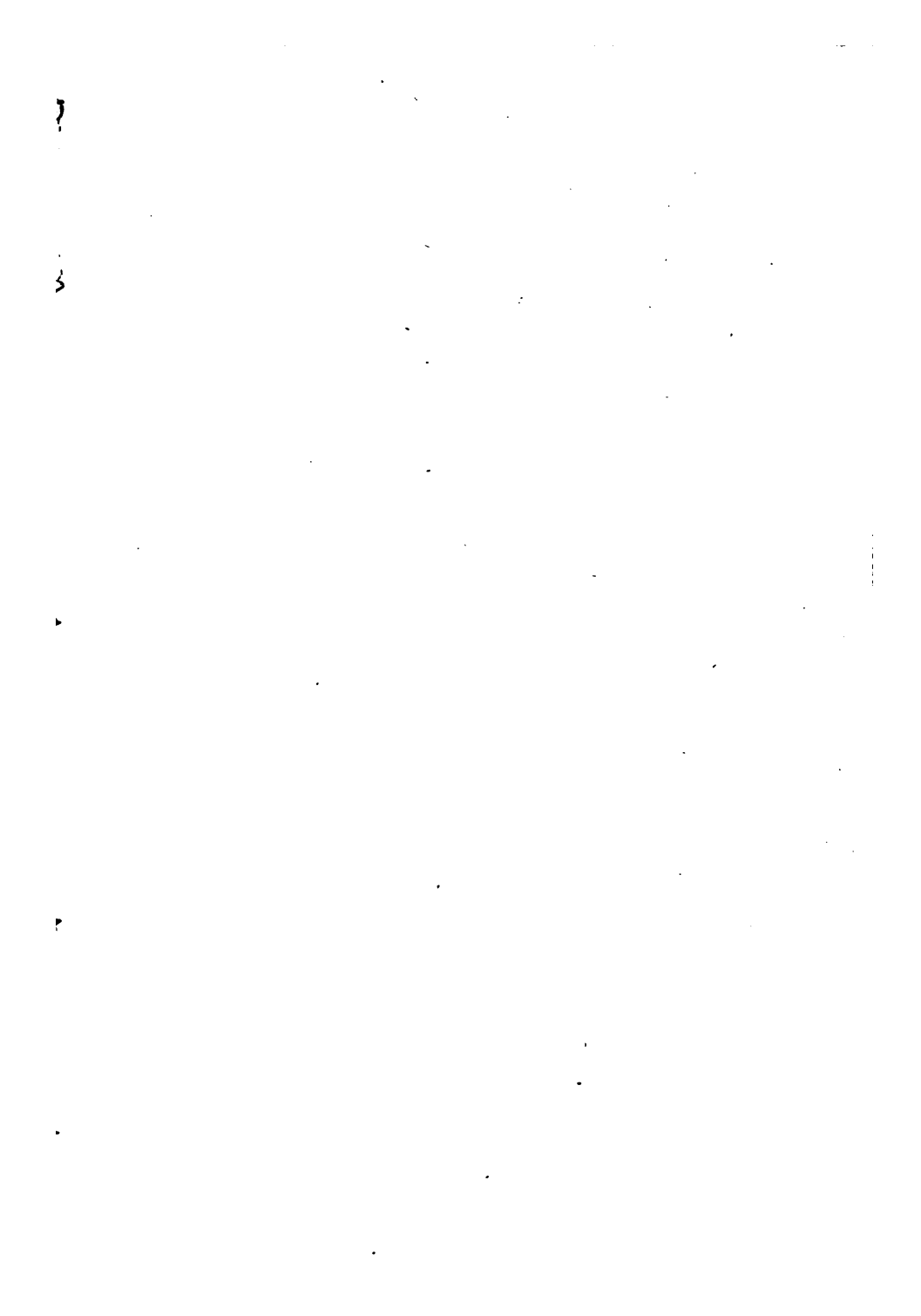
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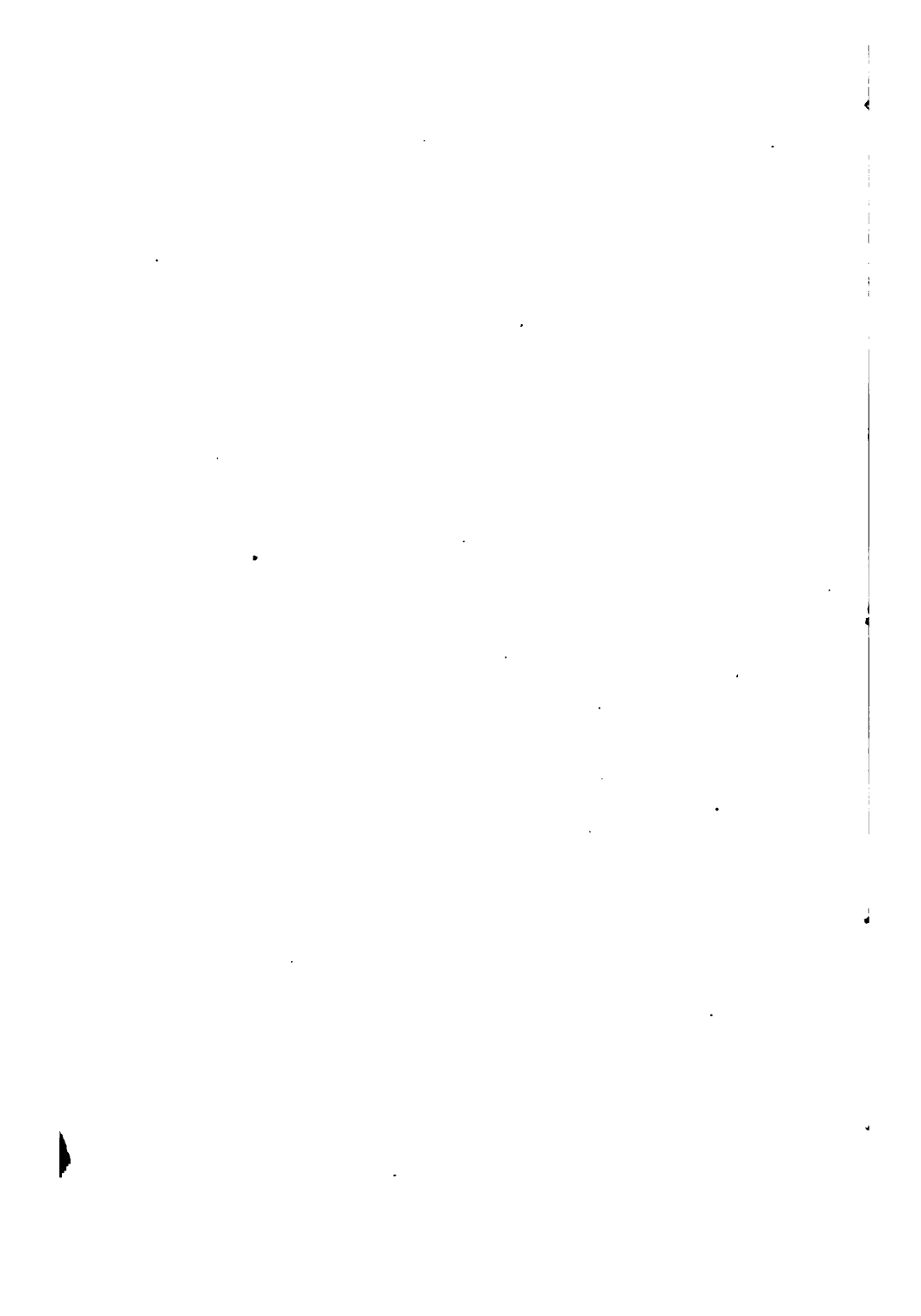
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